USE REQUIREMENTS: HARDWOODS

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Hitting the nail on the head is the objective expression of that which we all hope to accomplish in any undertaking. I must admit that as youngsters we probably didn't realize it as such. However, in satisfying the natural urge to drive nails into anything and everything at hand gave me the first introduction to the fact that in more ways than one you couldn't always hit the nail on the head when working with hardwood. There have also been a number of times during the past 40 years since those earlier days that I have again thought, "Let's give the hardwoods back to the Indians." This, of course, would be when some specific drying problem, checking, warping, swelling or other related trouble seemed insurmountable, or again in the woods when little yield came from big trees.

Of course, such thinking was only in a rash moment and later considered reasoning always left a guilty feeling for ever harboring such thoughts. I am sure that all of us who have ever lived and worked with our northern hardwoods would never really be guilty of treason to them. Nevertheless we should be always alert to capitalize on their good qualities and as with your friends or acquaintances, never intentionally aggravate or make vulnerable any of their weaker points.

Let us now get into the subject at hand of hardwood use requirements.

Earlier Day Requirements.--Close association with lumbering and life on a farm in New Hampshire soon taught me that wood was used for many purposes other than only a convenient material into which nails were to be hammered. An introduction into the qualities of the different hardwood species and their selection for whiffletrees, wagon tongues, sled runners, sleigh shafts, ax, cant hook, tool handles, well-cover planks and fence posts, to mention but a few, was included in boyhood training.

Even to this day a nice piece of white oak, or maple, or ash, brings back memories of the early lessons and practice spent to rough shape the stock with hatchet and drawshave, of taking full advantage of the grain, and then allowing the wood to season by slow drying in the shed so that no loss of strength occurred. Also the chunks of hardwood that would keep the fire in the kitchen range throughout the night with still enough coals to "catch" in the morning, are still reminders of the old days before coal (or oil for heating) and gas or electric stoves.

B.B.M., the common term for the hardwood mix of squares and dimension stock of birch, beech, and maple, made up many a load of stock that eventually found its way into chair seats, stretchers, legs and other furniture parts, floorings, turnings, etc. For some reason everyone seemed to have more time in those earlier days and the slow air-drying allowed mixed species to be used and little serious trouble developed. This is not always true today with

higher speed drying, mass production, and the elevated quality product we all now demand. We must also realize that, in general, choicer timber stands were then available for cutting and selection of higher-quality logs, and perhaps it would be well to quickly review this subject.

Forest Land Changes.--The records show how our Massachusetts woodlands diminished in acreage from the days of the early settlers to the low period around the Civil War, and then the return of much of the land that had been cut and more or less cleared for agriculture and pasture, back through the cycle of softwoods and hardwoods to the present. Through all these cycle changes our pathologists, geneticists, and agronomists have unearthed con siderable early data and recorded much more in the later years, which all added together should help those engaged in forward-looking silviculture to arrive at this forest-tree improvement objective successfully.

During these transition forest cycles we have had the ravages of the various blisters, blights, wilts, etc., that have certainly affected out economy at one time or another. We all know of the chestnut blight that took away a wood that had certain characteristics that endeared it to many users. However, almost paralleling man and nature in contributing to the forest land changes, has been manes changing of living standards which, coupled with ad-vances in science, wood technology, surface finishing, etc., now leads us to review all these changed demands that bring us up to the present.

Requirement Specifications.--We have much less or even little need of many of the characteristics that were so essential a few years ago. Qualities we felt then were an absolute necessity, today can be a minor factor.

A few of the examples are found in the several items already mentioned in this talk. Chain saws have reduced the demand for ax-handle stock of Paul Bunyan strength. Oil burners keep the fires throughout the night without the further need for long burning chunks of hardwood. Furniture and cabinet re-quirements can use softer surface woods with the present day tougher lacquer and alkyd resin surface finishes. Pentachloro-phenol and other wood preserva-tives now make many woods equal to chestnut in withstanding decay from mois-ture.

There are other changes too that we wood people donut like to proclaim, such as the plastics that have replaced tool handles, clothespins, toy parts, and many others formerly made of wood. But offsetting these losing races with plastics and other materials have been the recent developments of groundwood moulding, and the advances in chip and sawdust board manufacture. Both of these will play a very important part in the next generation, and the moulded wood items of hardwood will be very common practice and offer an opportunity for new wood uses. Here are several exhibit samples of this new art, and with thought of this in mind we come to what we might call

Hardwood Specific Requirement Demands.--Granting that we will not desire that all our hardwood lumber requirements be for a material suited only for grinding up as a base for hardboard, chipboard, or wood-flour moulding, I would like to select three or perhaps four species that I believe would ful-fill most hardwood requirements for our cabinet and furniture industry in the Northeast. These would be of the faster growing varieties that should offer an opportunity to economically cultivate them as a crop, and weeding out other hardwood species that we may have formerly considered more valuable due mainly only to historical precedent.

I have recently been experimenting with a small shipment of plantation grown Eucalyptus, harvested near Durban, South Africa. Here are a few samples of the finished wood, and the few pieces of furniture we made up looked very nice. They have had growth as high as 18 inches diameter in 9 years, and the low extreme is 9 inches in 18 years. Crop rotation is 9 or 10 years and average sawlog size on that basis is 10 inches diameter, rarely exceeding 20 inches and 22 feet in length. The wood, indigenous to Australia and known as Sydney Blue Gum,averages approximately 40 pounds per cubic foot (dry), but varies considerably,the Zululand plantation running more uniform than that from Transvaal. Some 20,000 acres of this are under cultivation at a 12 x 12 foot spacing and pruned high to develop long knot-free cuttings.

I am certain that we should consider thinking in terms of smaller-diameter logs. Certainly there is nothing gained in waiting until a tree is 2 feet in diameter and find when it opens up that it is full of dead heartwood, which is entirely unsuited for any of the lighter colored, modern furniture demanded today. Most end uses today do not require long cuts and with modern gluing, narrower boards will produce a more warp-free panel than wider boards from larger logs. It is still necessary that we aim for hardwood lumber that will produce the highest possible percentage of knot-free cuttings.

Geared in with planned timber crops to utilize the lumber to the best advantage would be more widespread use of bolter saws rather than long-log sawing. With clear, round 12-inch diameter bolts, a far greater clear cutting yield would result than is possible from long crooked logs of twice that diameter.

I suppose at this point I could ask for a tree that would be out of this world" in its ability to dry with no shrinkage, checking, warping, or twisting problems; but let's be reasonable and recognize that no wood structure or growth would do all this. Instead, we would ask merely that some of the out standing objectionable points be eliminated in the wood we select for future consideration. For example, we would not feel bad to miss the oak's tendency to honeycomb, the insistence of beech to surface-check at the drop of a hat, or the mineral streaks in rock maple that are hard on cutters, saws, and the finishing superintendent.

We would like to set up engineered straight-line fast drying for a specific product and as I pointed out in an article that will shortly appear, we will soon be seeing more of the fast vapor drying at high temperatures. There have already been numerous installations in this county of the type of high, speed drying ovens operating similar to the European Hildebrandt kiln, (one of which is now undergoing tests at the Canadian Forest Product Laboratory at Ottawa). The H. C. Mahon Company of Detroit have engineered and manufactured drying ovens that are capable of drying 1-inch yellow birch in 3 to 4 hours. We will want our woods to meet such requirements.

A U.S.D.A. report in 1951 shows that 280 million board feet of hardwood was consumed by New England industry in 1948. Probably we should figure on 300 million board feet a year in the future and approximately half this amount could be produced for, and consumed by the furniture and related household products manufacturers. It would seem that we could set our sights to grow and harvest 150 million board feet of hardwood a year to meet New England's furniture needs, barring no radical change.

We will need a close grained wood that will be versatile, that will season and kiln-dry well, machine easily, have an ability to take stain or paint, and that can be rapidly grown to replace the diminishing hard maple, beech, and black and yellow birch. To fill this need I would suggest considering white birch (Betula papyrifera). I have seen several examples of items made from white birch trees less than 20 years old.

Secondly, there is need of a wood with a slightly open grain that could be finished in the silver gray or the slush and wipe finishes that are always quite popular. Also if possible, this wood should have superior characteristics to the oaks. It was the silk-stocking-snagging tendency that put our northern oaks in disfavor a few years back, and now only the low labor and material costs keep oak in demand in Arkansas and other southern areas. The northern white ash (Fraxinus americana). would fill this spot and I wouldn't be surprised if it would meet the demands also of a specialty wood that Jim Tynan will talk about later. Some of the second-growth ash from just across the Massachusetts line in southern Vermont is doing a fine job for us in making possible a line of furniture with which we regularly do nearly two million dollars business a year. I would like to show a few slides of this "Ashcraft Grouping" as we call it if there is time later on the program.

Last but not least we need a hardwood that can be used for construction purposes. that will make good core stock and that has good stable qualities. This would be used for numerous purposes, but what I have particularly in mind would be for a core for the melamine and phenol plastic laminate surfaces that is in growing demand and that will be a 'must' for most top counter and table surfaces in the future. This or these last woods, I will leave to you folks that have been making a study of experimental breeding and I am sure that my friend Scott Pauley has some that can be grown at well over a half-inch a year in the basswood, poplar or like group, or perhaps even a new chestnut that would give us back that wood we really do miss. Perhaps even some other hybrid nutwood of the butternut variety may be developed which would provide a dual crop of economic value.

Proven Applications.--Time may not permit me to show the several examples of what some of these aforementioned woods could be expected to do for us in the future. I assure you that in each case we have sound proof that betting on them will not be a long shot and that they can be expected to come. in winners, particularly under what we would call our

Future Planning Handicaps.--Here I can only point out the trend and review some of the thoughts previously mentioned. There is one thing we can be sure of and that is change. We have lately seen revealing things take place in the field of electronics. I am certain we shall see within our time many changes in our forest and timber programs here in our hardwoods area giving us sound economy through low-cost harvests integrated operations and high utilization.

We set up our woodworking factories for the lowest cost machine and assembly operations, and handling methods have been studied, conveyorized, and reduced to the present low cost. Why should we still have to suffer the high cost of present logging in the almost inaccessible areas where we now have to cut much of the hardwood lumber being consumed by these wood-using industries today? There are great possibilities for hardwood timber as a crop planned for low-cost harvesting and to meet industry needs.

In conclusion, I am sure we should not have to go to South Africa for plantation-grown species of hardwoods, but as the rooster said to his hens when a football bounced inside their yard, "Look girls, I don't want to complain, but please just look at what others are producing outside."

IMPROVEMENT OBJECTIVES

DISCUSSION

Pauley This might be an appropriate time to remind the foresters, silviculturists, and researchers present that we are dealing in the forest with tree phenotypes. This term phenotype is, I know, familiar to most of you but it may have slipped your mind. It is a very important basic concept in genetics and in biology in general. The phenotype is defined as the physical and measurable end product in the interaction between the genotype of a particular organism and its environment. All the trees growing in our forests are phenotypes. I mention this because I thought I detected, perhaps erroneously, in some of the remarks that were made by the panel members, a tendency to segregate environment from heredity.

In the early part of this century, there were two schools of thought. One held that the environment was the most important factor in the growth of organisms; the other maintained that the genotype was most important. Now we know that such arguments are futile. Neither environment nor genotype can be given special credit or rate any more importance than the other in efforts to improve trees or other crops. I'd like to point out in this connection that I think geneticists in general have a natural tendency to emphasize the genotype because they are especially interested in gene manipulation as a means of phenotypic improvement. On the other hand, much of our forestry has developed under a strong environmentalist influence. Ecologists, plant geographers, physiologists and other specialists in the environment, have played a very important role in the development of silvicultural practices. It is natural for them to emphasize the importance of environment. The introduction of the idea of tree improvement from the genetic standpoint is comparatively new.

We talk frequently about the tremendous improvements that have been made in the agricultural field. We know that there have been marked advances in the quality and yield of maize and other crops. The geneticists like to take credit for these improvements. They say we've developed better genotypes. But I want to remind you, as a geneticist, that those improvements would not be of the caliber that they are had not the agronomists kept in step; had they not developed soil management techniques and better fertilizer applications along with these genetic improvements.

There is one other point brought up by Dr. Bramble. I'm no authority on forestry in this region, but it seems to me that a good portion of this area is going to be managed under systems of self-reproduction. The amount of planting that has been done is rather limited, and the prospect is that there isn't going to be a great deal done in the future. There is no question that the best way directly to improve our trees genetically is by planting better genotypes. But I think we must consider the problem from the viewpoint of the silviculturist and the forester who is managing the self-reproduced stands. He wants to know, "What can genetics contribute? What has genetics to offer me?" He says, "Here are these trees in this area. I can't do anything about their genotype." That's a fact. He can't do anything about the genotypes that are present on the area. I feel that one of the important contributions genetics research can make to the application of silviculture in self-reproduced stands is to provide a sounder silvical basis upon which the silviculturist can draw for reliable fundamental information. I think most of the silviculturists here will agree with me that the amount of reliable silvical knowledge we now have is very modest indeed. Much of it is based upon empirical observation. I think that one of the important contributions of our genetic research will be the increase in quality and quantity of our silvical knowledge.

Lambert I think Bill House brought out a good point that bears on Dr. Pauley's statement. Trees need to be developed by geneticists, to grow on their poorer sites as well as on their more optimum sites.

House I feel that foresters have a problem there because the good sites are rather rare, at least the good sites that have not been taken up by the kind of trees we want. Its the poor sites with their less well adjusted trees were worrying about.

Bramble The problem facing the forester is to plant the right tree on the right site. Perhaps through genetics we can get races of trees that are adapted to grow on the poorer sites.

McQuilkin There has been no mention of the old familiar furniture woods such as walnut and black cherry. I personally prefer cherry and black walnut to the blond furniture woods.

Marquis Isn't it possible that the preference for different types of woods depends on their availability? Scarcity and high price of one kind could lead to increased use and preference for one that was more abundant.

Parrish The demand, country wide, has gone nearly to 70 percent for the lighter colored woods. Cherry, or the use of cherry, in this area is practically gone. In Pennsylvania cherry is staging a little comeback for traditional furniture, but if two or three large manufacturers, like ourselves needed cherry in large quantities there would not be enough to keep us going. There will always be a demand for good cherry, but in greater demand is the more popular modern groups requiring the lighter color wood. I'm thinking of white birch as doing all cherry could do. At one time many school boards specified no other wood than cherry, but when cherry became scarce, there was a premium of $10 M offered for red heart birch. Today one doesn't want the red heart birch, the lighter colored sapwood commands a premium. There is nothing any surer than change. We are all sure of that, and perhaps today's light wood may sometime again give way to the darker woods.

Schreiner We have heard that industry may change its mind as to the particular wood properties it wants. I get the impression that even in the high priced hardwoods rapid growth may be the one thing we can count on for the next hundred years. If one industry won't, or can't use rapid growth I think that bulk cellulose, produced on straight, knot-free trunks in a short period of time will always pay off. I'd like to ask the panel their opinion on whether or not rapid growth would be one improvement that we can safely count on. I'm pointing this question toward my paper tomorrow morning on breeding and hybridization.

Bramble I think that is the one thing we can count on. The maximum production of wood per acre in the least time is one goal that I think any forester or industrial user would figure will not change. That's a very sound basis for planning.

Parrish In most cases in this country it is not industry that dictates what type or species of product or material will be in greatest demand. The public chooses and sets the trends. What eventually determines this is the value offered the consumer by the various approaches of different manufacturers, settling in the end to that offering the best value in satisfying customers' needs and tastes. Z am sure that rapid growth and economical harvesting would allow industry to pass on better values to the consumers.

Marquis Rapid growth certainly seems to be one improvement that will pay off, but the growth will have to be on the right trees. We're already growing too much worthless stuff. Here is a field where genetics, forest management, and economic analysis can all work toward a common goal.

Lockard The subject of this session is "Objectives." A fine specific objective would be to grow square trees without taper and without bark. That probably can't be done. However, the discussions have brought out other specific things toward which work could be directed. Spiral grain is one. Can we get trees without spiral grain or can't we? Knot-freeness is another item that ran through the discussions. Of particular importance in this connection is the tendency toward adventitious budding or branching which can change entirely the use possibilities for many species. If we open a stand we often get so-called water sprouts. We used to think that these were just surface phenomena but it seems they go deeply into the trees. The tendency seems to be more evident in some species than in others. I don't know whether it is uniform for a species or not. Another question is the character of tight knots as opposed to loose knots. Can tightness be controlled? There are many other specific things that have been mentioned as quality objectives with quality being defined as adaptability to use. All of these should be thoroughly evaluated as possible guides to a tree improvement program.

One other thing that struck me was the emphasis on fast growth as an objective. What do we mean by fast growth? Do we mean fast diameter growth, fast height growth, or do we mean both? The two don't necessarily mean the same thing in terms of quality. If we can get a tree that doesn't grow very fast in diameter but will shoot up rapidly, we could have the basis for really "laying on" quality wood at a high rate.